

Exposure to Visible Light Emitted from Smartphones and Tablets Increases the Proliferation of *S. aureus*: Can this be Linked to Acne?

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Abstract

The exponential rise in the use of handheld devices such as smartphones and tablets has raised global concerns about the safety of these devices. Smartphones, tablets, laptops, and other LED screens can emit high levels of short-wavelength visible light (blue region in the light spectrum). Over the past several years, the biological effects of exposure to shortwavelength visible light emitted from smartphones and tablets on the eye and skin (premature skin aging) have been widely studied. However, to the best of our knowledge, the effect of exposure to light emitted from these devices on the proliferation of *Staphylococcus aureus* and the possible association of its exposure to light and acne pathogenesis has not been investigated yet. In this study, the effect of exposure to visible light emitted from the screens of a commercial smartphone (Sony Xperia) and a commercial tablet (Samsung Galaxy Note 10.1) on the growth rate of *Staphylococcus aureus* bacteria (ATCC No. 25923) is investigated. Some studies show that *Staphylococcus aureus* can intensify the symptoms in chronic inflammatory skin diseases. Acne vulgaris has been reported to be the most common human skin disorder. This skin disorder was reported to be persistent in 80% of the women (58% of these women had an ongoing need for treatment). All experiments were performed at 37°C in a separate incubator and bacteria were grown in 20 ml Brain Heart Infusion Broth (BHI) 10 cm plates. Then, in a dark environment, bacteria were exposed to the light of the smartphone and tablet at a distance of 2-3 mm (common distance between the smartphones and facial skin). The brightness of the displays of these devices was set at 50%. The control samples were exposed to the same intensity of light generated by a conventional incandescent light bulb. The growth rate of bacteria was examined by measuring the optical density (OD) at 625 nm (UNICO UV-2100 spectrophotometer) before the light exposure and after 30, 60, 90, 120, 150, 180, 210, 240, 300, and 330 minutes of light exposure. The growth rates of bacteria in both smartphone and tablet groups were higher than that of the control group and the maximum smartphone/control and tablet/control growth ratios were observed in samples exposed to digital screens' light for 300 min (3.71 and 3.95, respectively). These ratios declined in samples exposed to screens' light for durations higher than 300 min. Altogether, these findings show that exposure to short-wavelength visible light emitted from smartphones and tablets can increase the proliferation of *Staphylococcus aureus*. Due to limitations of this study, further studies are needed to shed more light on the dark corners of the effect of digital screens' light on different microorganisms and to verify if these exposures can be linked to acne pathogenesis.

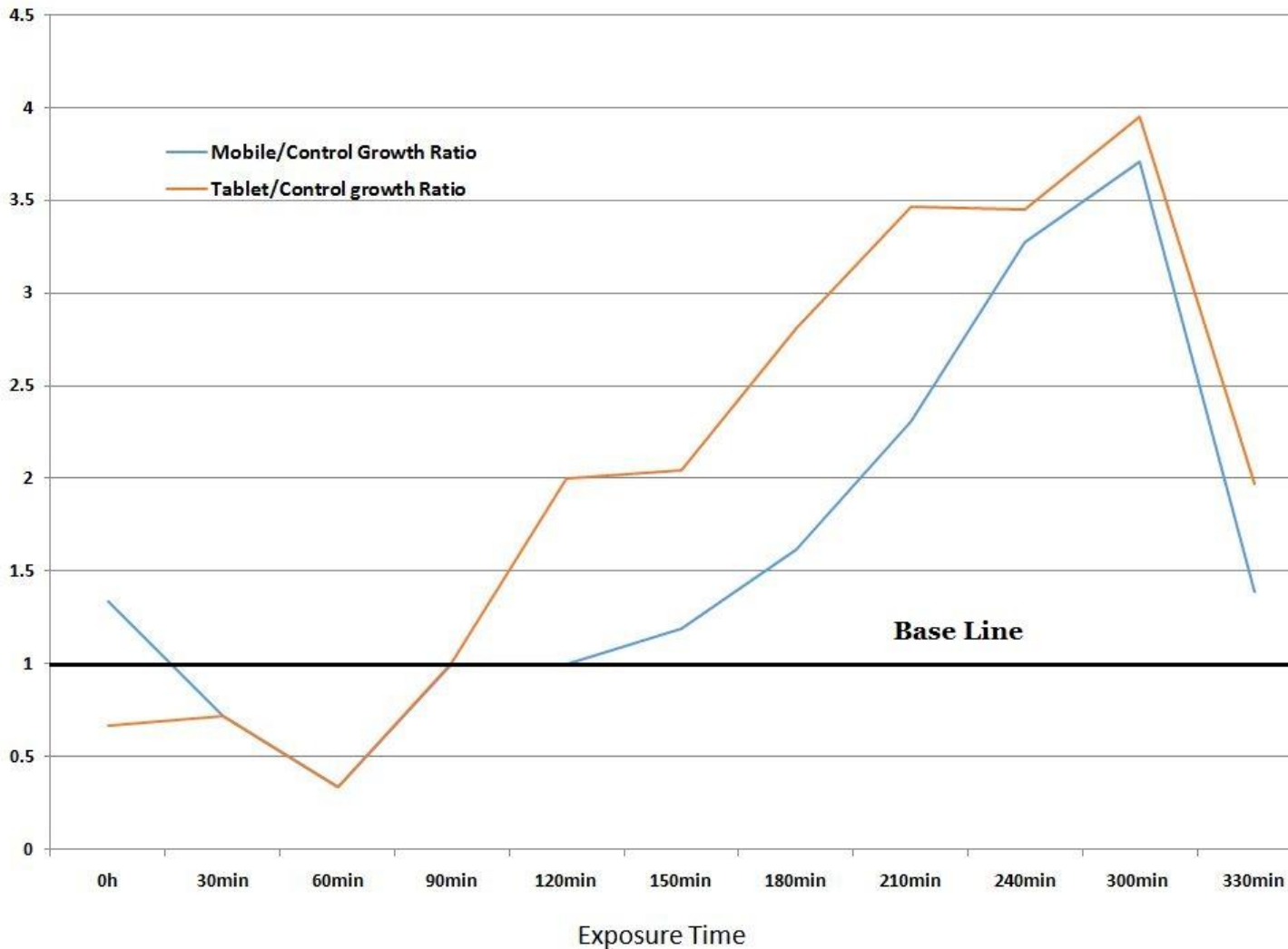


Figure 1. The growth rates of bacteria in both smartphone and tablet groups were higher than that of the control group. This chart shows that the maximum smartphone/control and tablet/control growth ratios were observed in samples exposed to digital screens' light for 300 min (3.71 and 3.95, respectively).

Keywords: Smartphones, Tablets, Blue Light, *Staphylococcus aureus*, Acne

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